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COUNTERWEIGHTED GRAB FOR DREDGE

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(56) Prior Art Documents
GB 605775
GB 900877
GB 697810

(57) Claim

1. A dredger comprising a floating body; a dredging means for dredging material from the sea bed; a lifting mechanism comprising a restraining winch coupled to the dredging means by first rope means for raising and lowering the dredging means; a travelling crab supporting said lifting mechanism and moveable between first and second extreme ^{horizontal} positions on guide means supported on a support means above said floating body; and counter-balance means suspended at or adjacent one end of said support means for counter-balancing said dredging means during raising and lowering thereof, said counter-balancing means being coupled to said restraining winch by second rope means wound on said restraining winch in the opposite direction to that of said first rope means.

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COMPLETE SPECIFICATION

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Complete Specification for the invention entitled: DREDGER.

The following statement is a full description of this invention, including the best method of performing it known to me:—

The invention relates to a dredger having a floating body on which the lifting mechanism features a restraining winch for a grab suspended on ropes. Such dredgers are well known, which are employed to reclaim sand and gravel from deep/large depressions. Clam shell grabs are used for dredging, whereby the opening and closing operation is either effected with the aid of ropes or effected through an hydraulic mechanism. The grab is suspended on a travelling crab, which is designed to be self-propelled, or which features a rope drive. A lifting mechanism for raising and lowering the grab is arranged on the travelling crab, being driven by a rope winch. Furthermore, dredges ~~also~~^{are} also known having mounted thereon a luffing jib and a lifting mechanism for a grab arranged on a jib. Such dredgers are primarily used for more limited outputs/capacities and for spot/concentrated dredging. The disadvantage of these known dredgers lies in the fact that during winching/lifting operations a relatively large dead load is placed upon the lifting mechanism, since the grab constitutes about a third of the load to be lifted. As a result, a high consumption of energy is needed during lifting and the lifting mechanism has to therefore be of a corresponding size and sturdy proportions. It is an object of the present invention to provide an improved dredger.

Accordingly, the present invention provides a dredger comprising a floating body; a dredger means for dredging material from the sea bed; a lifting mechanism comprising a restraining winch coupled to the dredging means by first rope means for raising and lowering the dredging means; a travelling crab supporting said lifting



mechanism and movable between first and second extreme positions on guide means supported on a support means above said floating body; and counter-balance means suspended at or adjacent one end of said support means for counter-balancing said dredging means during raising and lowering thereof, said counter-balancing means being coupled to said restraining winch by second rope means wound on said restraining winch in the opposite direction to that of said first rope means.

It will be appreciated that the term "rope" as used herein means any suitable form of flexible member and includes (but is not limited to) chains, cables and the like.

A dredger according to the present invention has the distinct advantage that the lifting mechanism can be designed for a more limited or lighter loading (i.e. greater efficiency), which is of considerable importance, particularly, for large lifting distances, which, for such dredgers, may be up to 100 metres or more.

The present invention is further described hereinafter, by way of example, with reference to the following drawings, in which:

- Fig. 1 shows a preferred embodiment in elevation,
Fig. 2 is a plan view of Fig. 1,
Fig. 3 illustrates a further embodiment of a dredger in a simplified representation in elevation,
Fig. 4 is a plan view of Fig. 3,
Fig. 5 is a simplified elevational representation of a further embodiment of the invention,
Fig. 6 is a plan view of Fig. 5,
Fig. 7 is an additional embodiment in elevation,
Fig. 8 is a plan view of Fig. 7,
Fig. 9 is a further embodiment of the invention in elevation,
Fig. 10 is a plan view of Fig. 9,
Fig. 11 is an elevational view of a dredger having a luffing jib and
Fig. 12 is a further embodiment of the dredger in elevation.

The dredger depicted has a floating body 1, on which various structures are mounted, i.e. a cross beam 3 is supported on girders 2, on which a traversing arm 4 is arranged for a travelling crab 5. The travelling crab 5 is provided with a lifting mechanism 6, which has a restraining winch 7. A grab 8 is suspended on the restraining winch 7, by which the grab 8 can be raised or lowered through a rope 9.

A rope 10 is wound on the restraining winch 7 in a contra-direction and is guided at one of the ends of the cross beam 3 over a deflecting roller/pulley 11 and supports a counter-weight 12 where upon the rope 10 is guided over a return roller/pulley 13

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on the counter-weight 12 to an anchorage 14 on the cross beam 3.

The heavier grab 8, heavier by approx. 20% ^{with} respect to the weight discharged to the counter-weight 12 is counterbalanced/by the counter-weight 12 ^{during lifting}

which lowers/falls at the same time, and, conversely, only limited braking forces act upon the lifting mechanism 6 during the grab lowering operation. On depositing the grab 8 on the bed/bottom of the sea, lake or similar, the lifting gear brakes are closed, so that the grab can operate under its full weight without being balanced.

In the embodiment shown, an additional winding/winching face is provided on the restraining winch 7 for the rope 10. One can also arrange the rope 10 for the restraining winch 7 such that the rope 10 wraps itself/on to the restraining winch 7 ^{directly} as it unwinds during the lowering of the grab 8.

By this design and arrangement of the counter-weight 12 the drive 15 even enables simplification of the design to be effected for the travelling crab 5, whereby this drive is arranged at the opposite end of the cross beam 3 in relation to the deflecting roller/pulley 11. The drive is effected via a rope 16, whereby a tensional force is produced during movement in the direction towards the crab drive unit 15, whilst in the opposite direction, the travelling crab 5 is drawn ^{towards} ~~away from~~ the counter-weight and ^{the drive 15 provides} ~~effects~~ a braking action. ~~on the drive 15.~~

With the embodiment depicted in figures 3 and 4 the grab 8 is counterbalanced directly with the counter-weight 12, by which

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the rope 10 is attached via an additional deflecting roller/pulley 17 on the travelling crab 5 to the grab 8. This arrangement can be used without further ado for light-dredgeable material.

With the embodiment in accordance with figures 5 and 6 the travelling crab 5 is provided with its own drive, for which the rope 10 is deflected via two additional deflecting rollers/pulleys 18, 19 in each case at the end of the cross beam 3 and is anchored to the other side of the travelling crab 5.

The embodiment depicted in figures 7 and 8 is suitable for a four-rope grab operation, whereby a further closing winch 20 is arranged on the travelling crab 5 next to the restraining winch 7. The rope 10 for the counter-weight 12 ^{is wound on} ~~is arranged to~~ the restraining winch 7.

In addition, figures 9 and 10 show an embodiment, for which the counter-weight 12 is separated/divided for hydraulic grab operation on a four rope winch, and the respective part-weight ^{wound on} ~~is arranged to~~ the restraining winch 7 or ~~to~~ the closing winch 20. In this case, the drive provided for the travelling crab 5 can be retained/utilized in the design.

For the embodiment for a dredger represented in fig.11 a luffing jib 22 is mounted on a floating body 1, which operates in conjunction with a chute/hopper 21. By a steep positioning of this jib 22 the grab 8 suspended from the jib can be lowered through the floating body 1 into the water. The raising and lowering of the grab 8 is effected via a rope 9 and a lifting mechanism 6 with ^a ~~the~~ restraining winch 7. Laterally from the lifting mechanism 6 is fixed a support 23 on the floating body 1, which has

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a deflecting wheel/pulley 24. From this support 23 is suspended, by means of a rope 10, a counter-weight having a return roller/pulley 13, the rope being guided over this deflecting roller/pulley 24 and over another roller/pulley 25 on the ^{furthermost} ~~most-furthest~~ end of the luffing jib 22 to the grab 8.

With this arrangement the rope 10 can be guided directly to the winch 7 and be wound in a counter direction to the movement of the grab.

With the further embodiment depicted in fig.12 the counter-weight 12 is suspended directly from the lifting mechanism 6, whereby the rope 10 of the counter-weight is wound on to the winch 7 in the manner illustrated.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A dredger comprising a floating body; a dredging means for dredging material from the sea bed; a lifting mechanism comprising a restraining winch coupled to the dredging means by first rope means for raising and lowering the dredging means; a travelling crab supporting said lifting mechanism and moveable between first and second extreme positions on ^{horizontal} guide means supported on a support means above said floating body; and counter-balance means suspended at or adjacent one end of said support means for counter-balancing said dredging means during raising and lowering thereof, said counter-balancing means being coupled to said restraining winch by second rope means wound on said restraining winch in the opposite direction to that of said first rope means.

2. A dredger as claimed in claim 1 further comprising a drive means for moving said travelling crab, said drive means being secured relative to said floating body and coupled to said travelling crab, the travelling crab being positioned between said drive means and said counter-balance means whereby said counter-balance means assists movement of said crab away from said drive means and serves to brake movement of said crab towards said drive means.

3. A dredger as claimed in claim 1 or 2 having a four rope grab operation further comprising a closing winch, said closing winch and said restraining winch being coupled to

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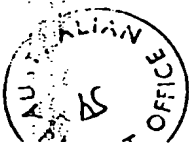
the dredging means for raising and lowering the dredging means.

4. A dredger as claimed in claim 1 wherein said travelling crab is self-propelled, and said counter-balance means is coupled to said travelling crab by rope means one end of which is wound on said restraining winch and the other end of which is secured to said travelling crab to form a closed loop such that movement of said travelling crab does not substantially alter the position of said counter-balance means.

5. A dredger as claimed in claim 4 further comprising pulley means on said support means on the side of said travelling crab remote from said counter-balance means; and wherein one end portion of said rope means is guided over said pulley means and secured to said travelling crab.

6. A dredger as claimed in any one of claims 1 to 5 wherein said counter-balance means comprises first and second counter-balance weights, each of which is suspended from said support means on respective sides of said travelling crab and coupled to one of said closing winch and said restraining winch by a four-rope winch system for hydraulic grab operation.

7. A dredger comprising a floating body; a dredging means for dredging material from the sea bed; a lifting mechanism comprising a luffing jib having a restraining winch coupled to the dredging means by first rope means for raising and lowering the dredging means; and counter-balance means suspended from the floating body at the rear of said luffing jib for counter-balancing said dredging means during raising and lowering thereof, said counter-balancing means being coupled to said restraining winch by second rope means wound on said restraining winch in the opposite direction to that of said first rope means.



8. A dredger as claimed in claim 7 wherein said counter-balance means is suspended laterally from the floating body on a support by way of a deflecting pulley means.

9. A dredger as claimed in claim 7 wherein said counter-balance means is suspended by rope means directly from said restraining winch.

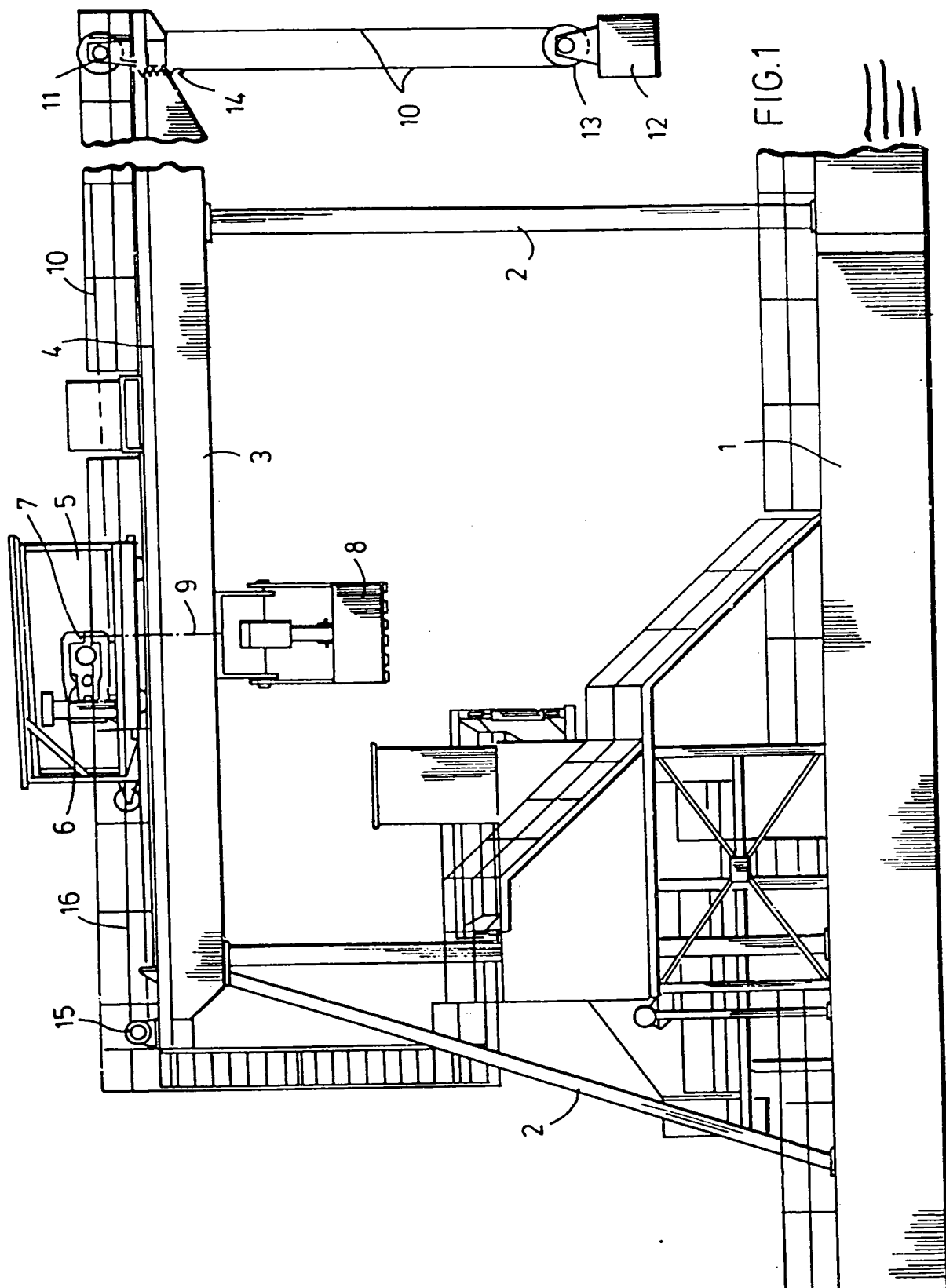
10. A dredger substantially as hereinbefore described with reference to Figures 1 and 2 ~~or Figures 3 and 4~~ or Figures 5 and 6 or Figures 7 and 8 or Figures 9 and 10 ~~or Figure 11~~ or Figure 12 of the accompanying drawings.

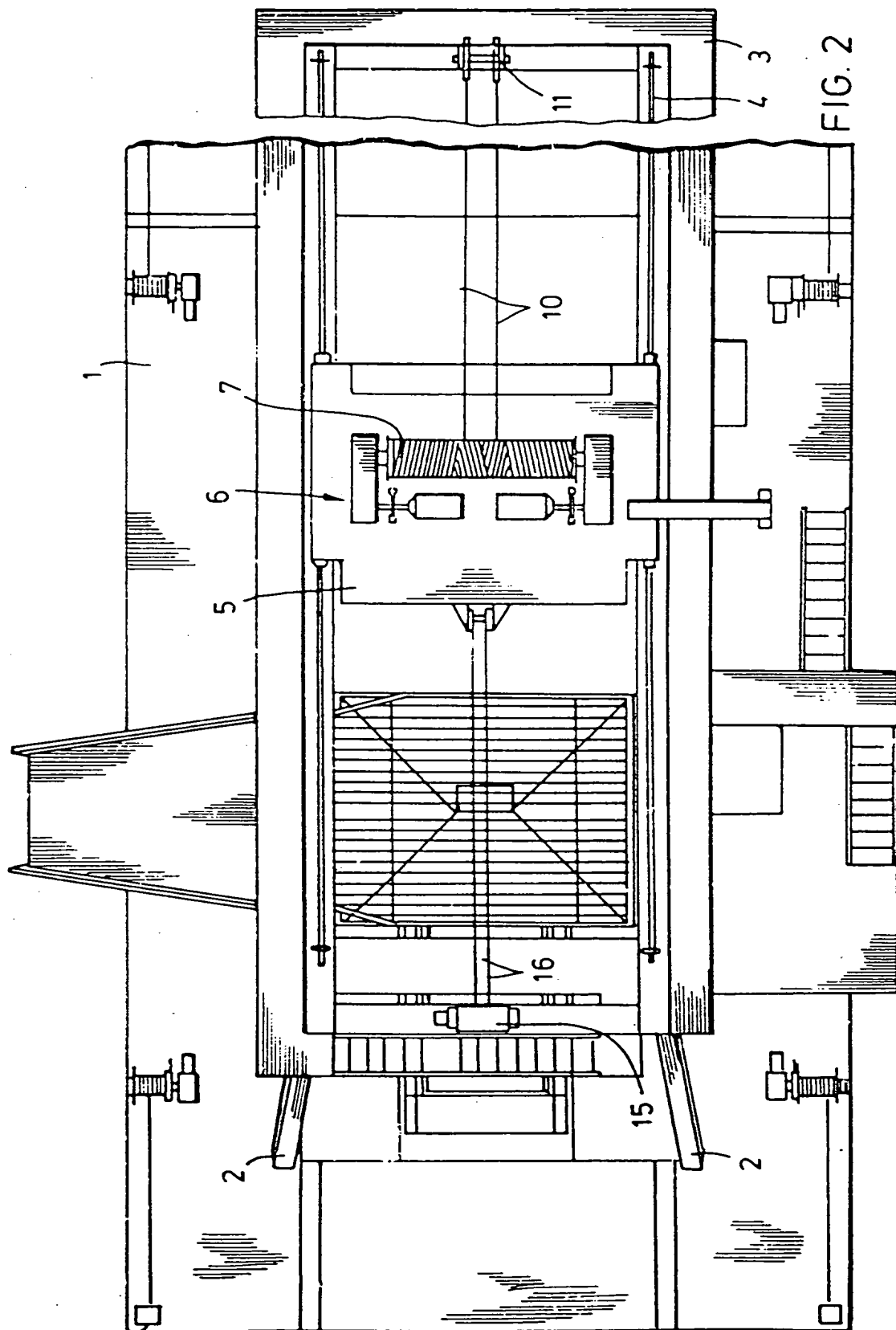
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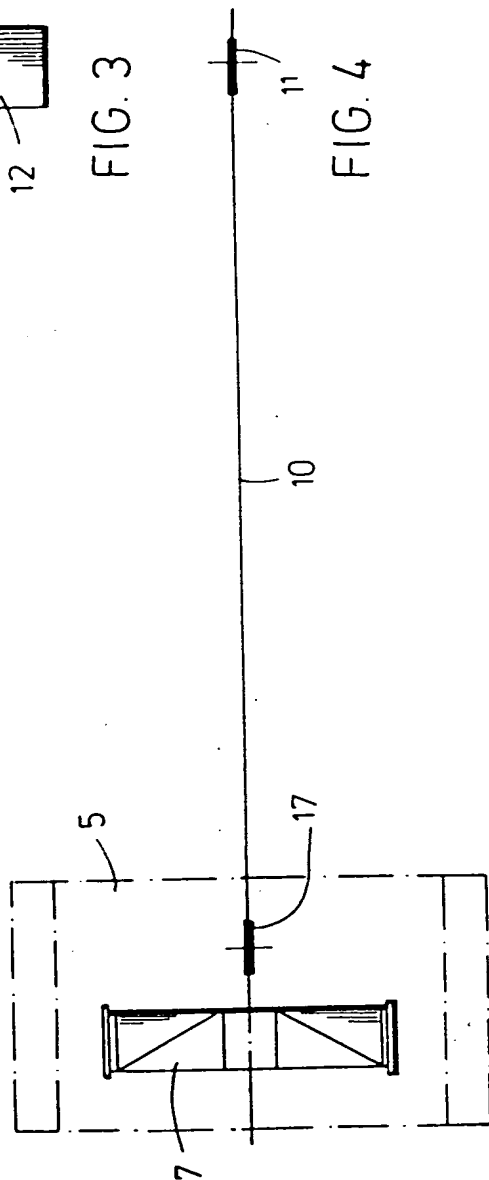
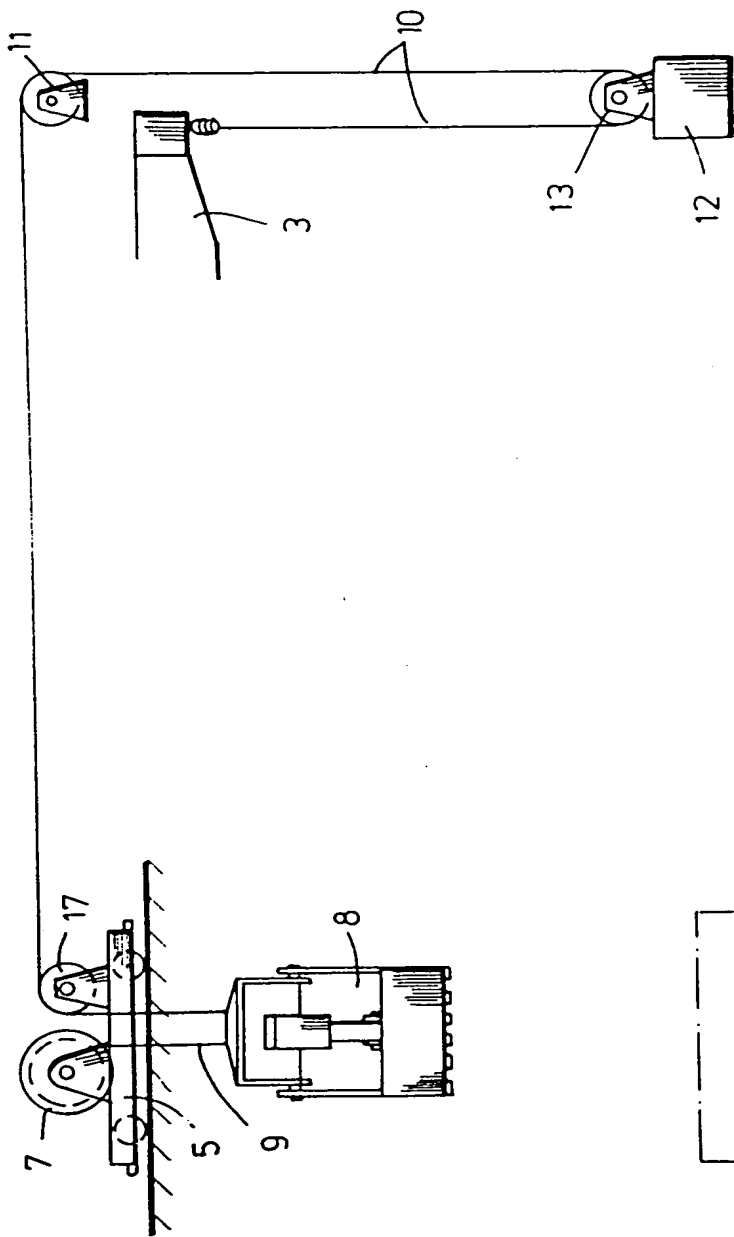
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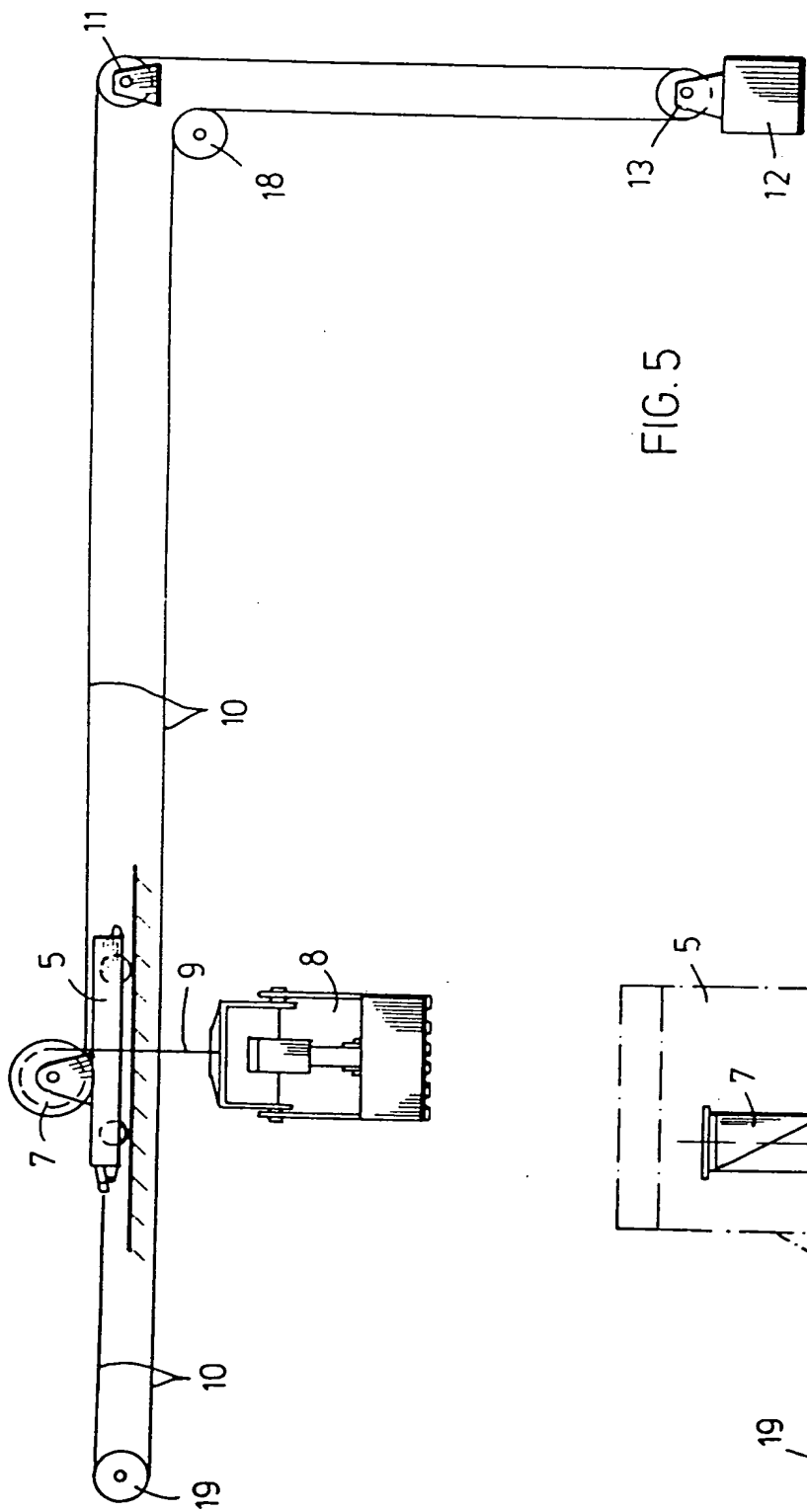


FIG. 5

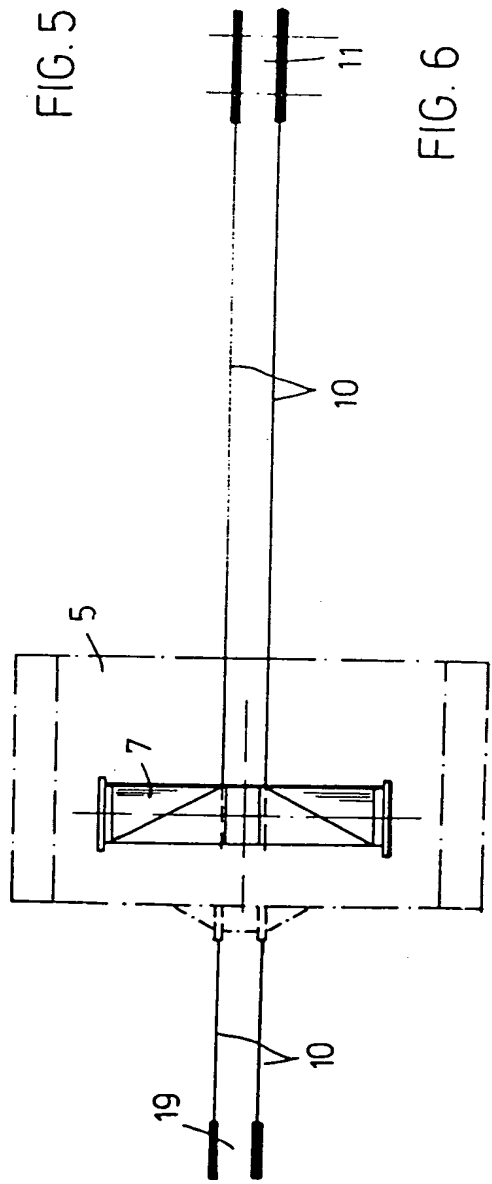


FIG. 6

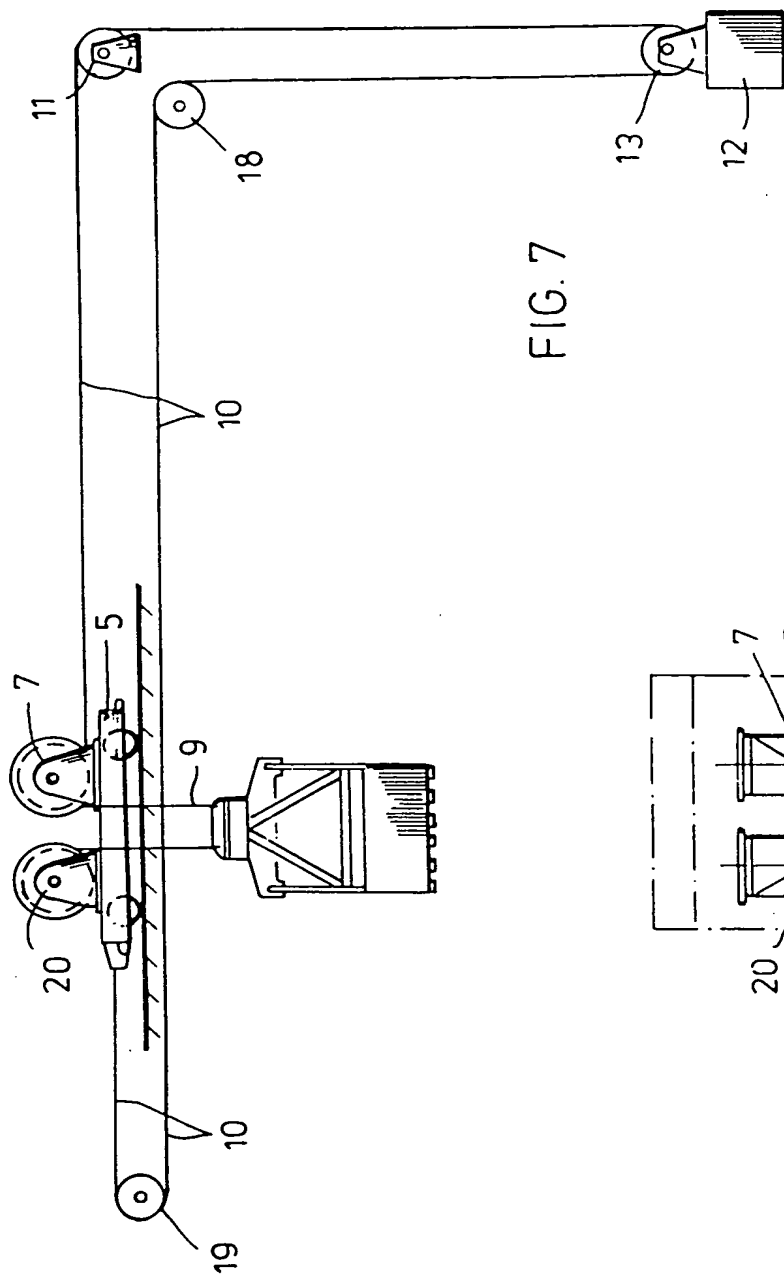


FIG. 7

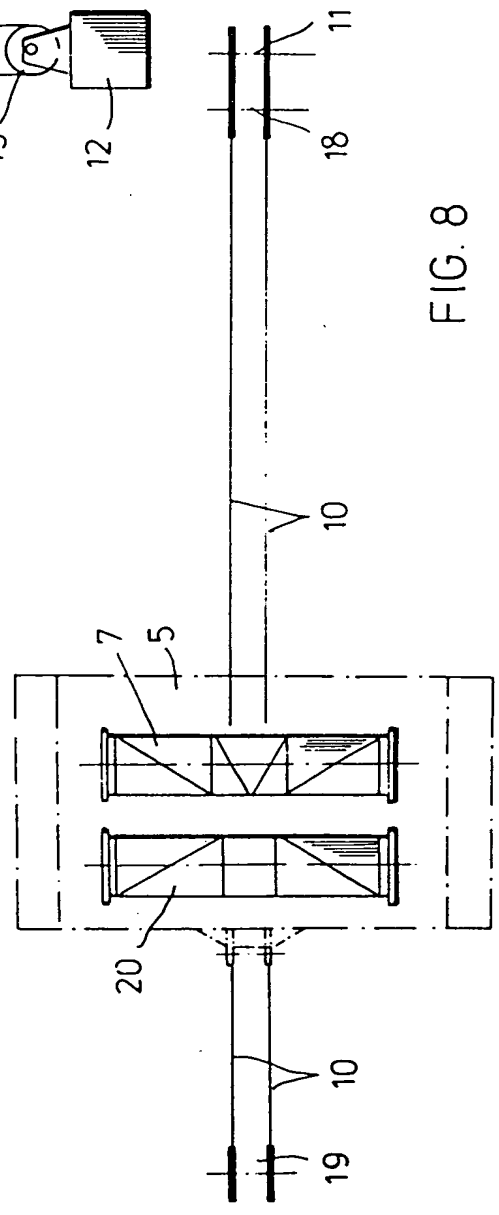
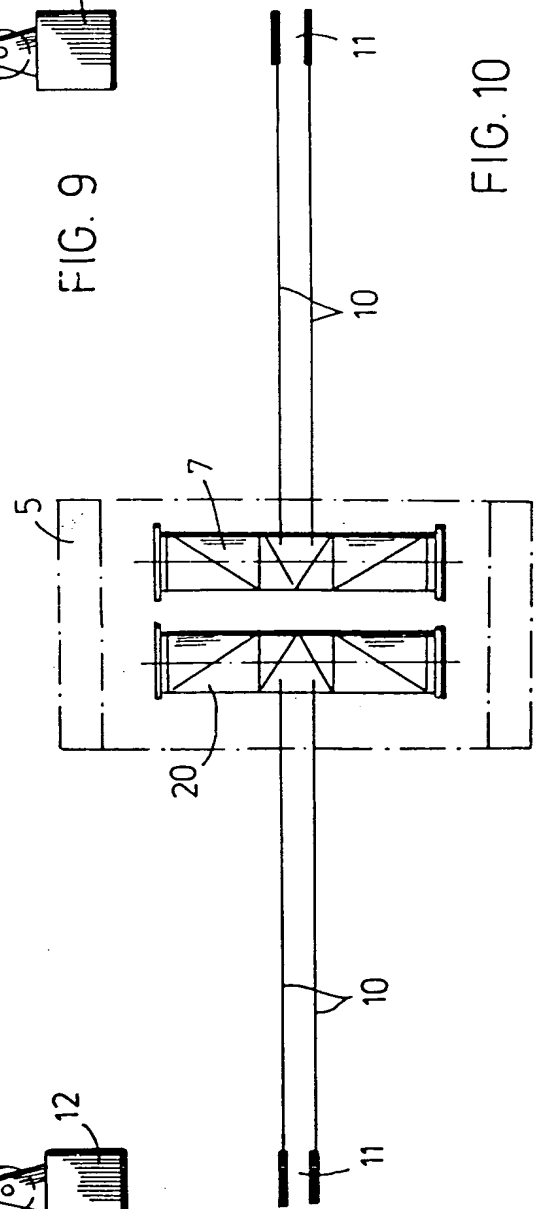
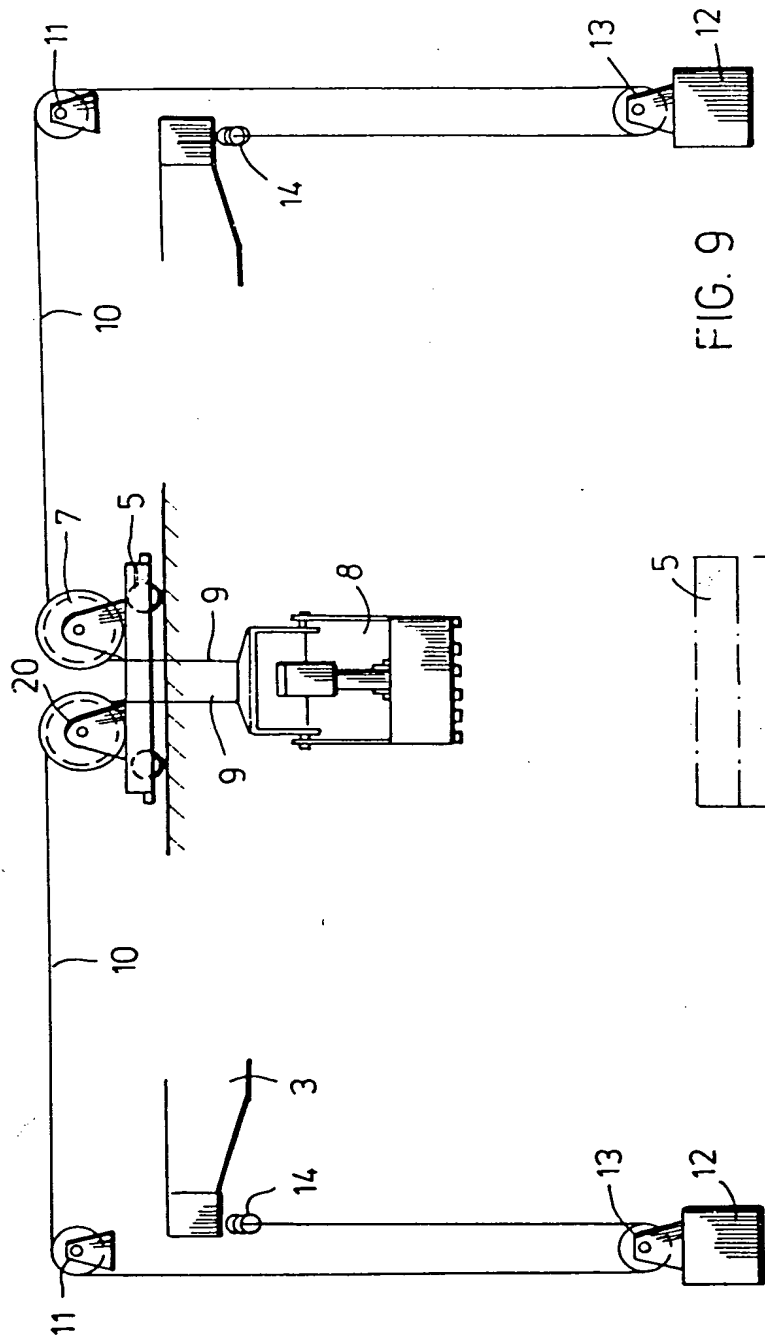


FIG. 8



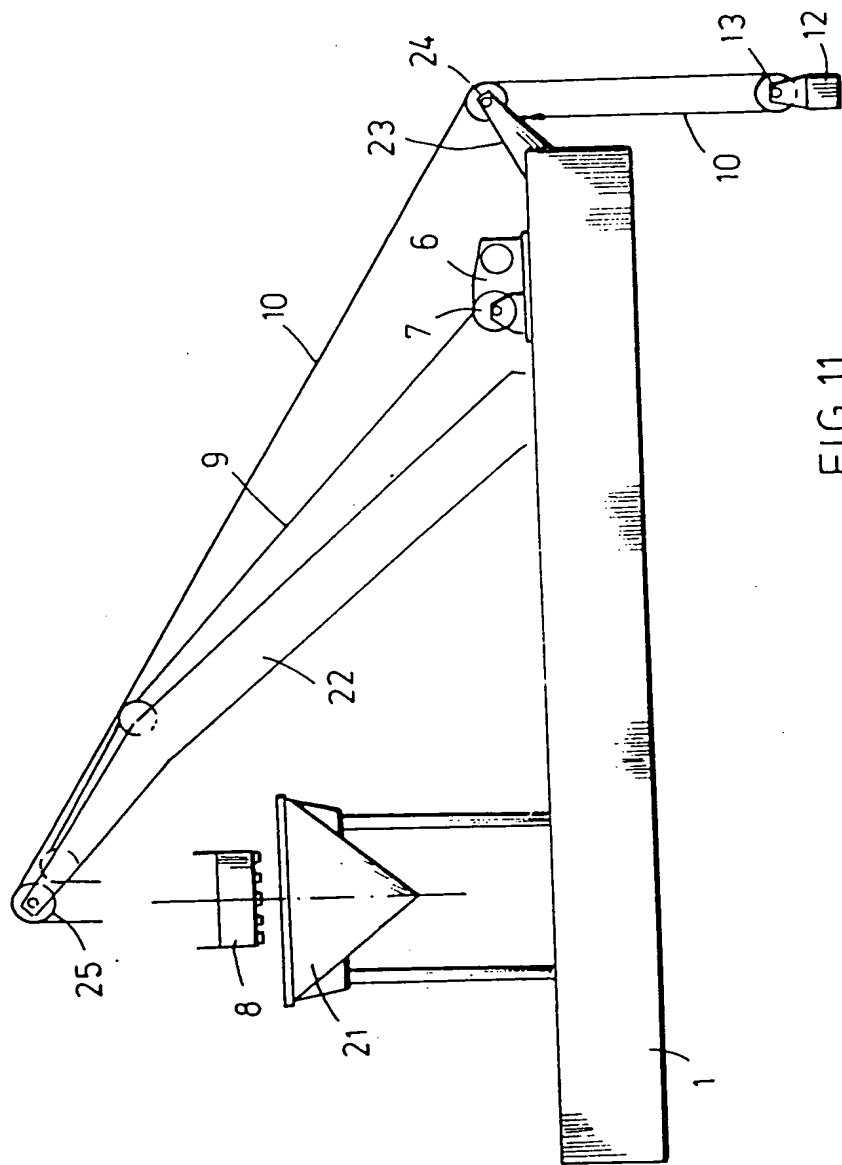


FIG. 11

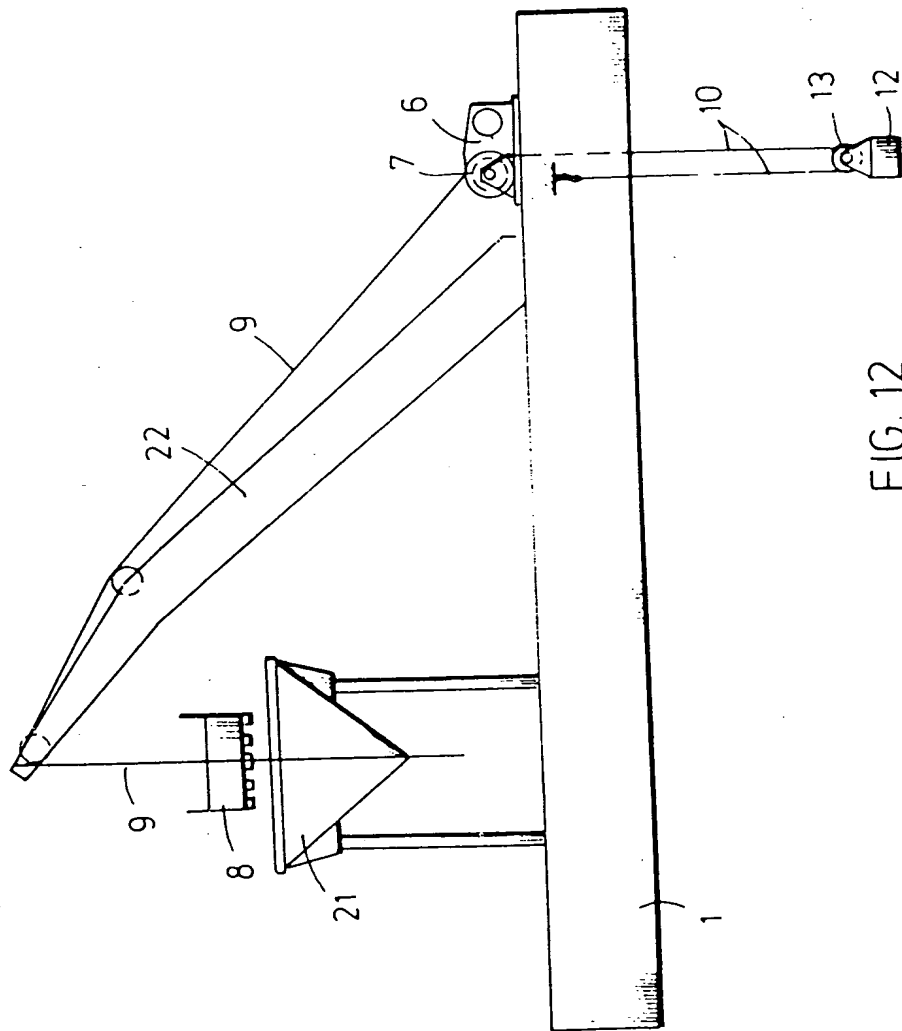


FIG. 12